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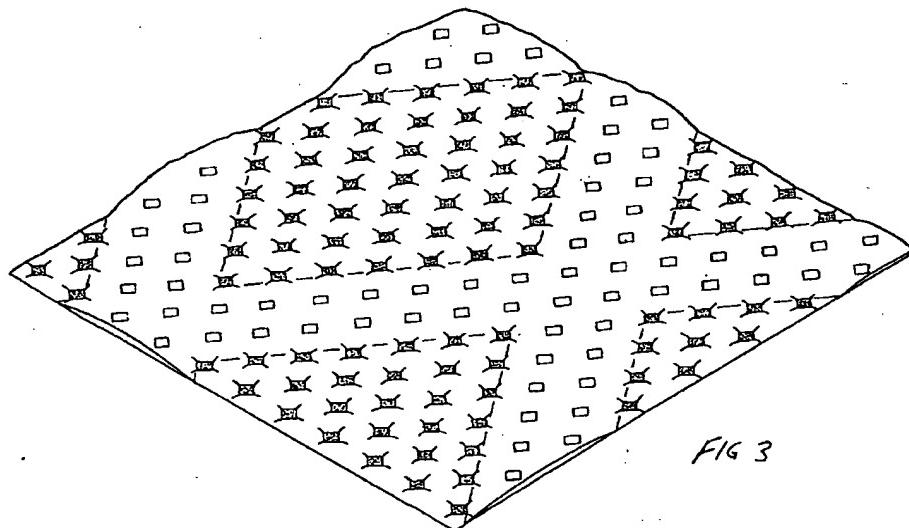
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### (54) Improved absorbent paper product and method of making

(57) An improved multi-ply absorbent consumer paper product (12) includes a first ply of absorbent paper web (14) having a first substantially regular pattern of pixel-like projections defined thereon and a second ply of absorbent paper web (16) having a second substantially regular pattern of pixel-like projections defined thereon. The second ply (16) is laminated to the first ply (14) so that the pixel-like projections of the first ply (14) are positioned substantially in abutment with corresponding pixel-like projections of the second ply (16), to form projection couples. A glue/dye material

(38) is positioned between the first (14) and second (16) plies to selected projection couples (50), but not elsewhere on the first (14) and second (16) plies, in a predetermined decorative pattern. This ensures that the decorative pattern is defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect. A method of making the product is also disclosed.



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**Description****BACKGROUND OF THE INVENTION****FIELD OF THE INVENTION**

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This invention relates to absorbent consumer paper products, such as tissue and towels, and to systems and processes for making such products.

**DESCRIPTION OF THE RELATED TECHNOLOGY**

Absorbent consumer paper products such as the high quality paper towels, napkins and toilet tissue manufactured by Scott Paper Company are in wide use throughout the world. In manufacturing such products, an absorbent base sheet is commonly embossed to increase the bulk of the product, improve product absorbency and roll building characteristics, and to create an attractive pattern on the product before it is packaged. Embossing can also aid in securing multiple plies of the absorbent web together. The standard embossing process in this industry involves passing the base sheet between a pair of pressure rollers, at least one of which has a pattern thereon that is intended to be impressed onto the base sheet.

It is also common for manufacturers of paper towels and tissue to place decorative patterns on the absorbent product that will be attractive to consumers. This is most often done by printing, although at least one manufacturer has laminated two plies of toilet tissue together by using a glue/dye substance that is laid out between the plies in a continuous floral pattern that will be visible to the consumer.

Typically, the individual plies in a multiple ply absorbent paper product such as a high grade paper towel are glued together after they are embossed so that they will not separate. U.S. Patent 3,556,907 to Nystrand ("Nystrand") discloses a method for producing laminated embossed webs wherein glue is applied to one side of a first web after the first web has been embossed, while the first web is still positioned against the embossing roll. The first web is subsequently laminated to a second web, which has been similarly embossed, in such a manner that the respective embossing patterns will nest against each other, as may most clearly be seen in Figure 4 of Nystrand. It is also known to laminate two embossed plies in a "pin to pin" orientation, or so that the peaks or projections formed during the embossing process are glued together, rather than nested.

The appearance of a particular line of tissues or paper towels is an important element in how the product is received by consumers, both aesthetically and in terms of perceived effectiveness. For example, if an absorbent paper product has a printed pattern that has visibly irregular color intensity, line thickness or borders, a consumer may conclude, rightly or wrongly, that there are quality problems with the product. The appearance

of bulk or puffiness is also important to consumers. Anything that can be done to improve the perceived bulk and pattern print quality of the product, then, is desirable and should be pursued.

**SUMMARY OF THE INVENTION**

Accordingly, it is an object of the invention to provide an improved absorbent paper product, and processes and systems for manufacturing such a product, that provides an improved consumer perception of bulk and product quality in comparison to absorbent paper products heretofore known.

In order to achieve the shave and other objects of the invention, a method of making a multi-ply absorbent consumer paper product, includes, according to a first aspect of the invention, steps of: (a) embossing a first ply of absorbent paper web with a first substantially regular pattern of pixel-like projections; (b) embossing a second ply of absorbent paper web with a second substantially regular pattern of pixel-like projections that is substantially identical to said first pattern; (c) applying a solution that is both a glue and a dye to said first ply of absorbent paper web in a decorative pattern with a partial applicator roll that has said decorative pattern defined thereon, said solution being applied in said decorative pattern only to said pixel-like projections, and not to areas on said first ply in between said projections; and (d) laminating said first ply to said second ply so that said pixel-like projections of said first ply are glued together with corresponding pixel-like projections of said second ply in said decorative pattern, but not outside of said decorative pattern, whereby the decorative pattern will be defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.

According to a second aspect of the invention, a multi-ply absorbent consumer paper product includes a first ply of absorbent paper web having a first substantially regular pattern of pixel-like projections defined thereon; a second ply of absorbent paper web having a second substantially regular pattern of pixel-like projections defined thereon, said second ply being laminated to said first ply so that said pixel-like projections of said first ply are positioned substantially in abutment with corresponding pixel-like projections of said second ply so as to form projection couples; and a glue/dye material applied between said first and second plies to selected projection couples, but not elsewhere on the first and second plies, in a predetermined decorative pattern, whereby the decorative pattern is defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.

According to a third aspect of the invention, a system for making a multi-ply absorbent consumer paper product includes first embossing means for embossing a first ply of absorbent paper web with a first substantially regular pattern of pixel-like projections; second embossing means for embossing a second ply of absorbent paper web with a second substantially regular pattern of pixel-like projections that is substantially identical to said first pattern; means for applying a solution that is both a glue and a dye to said first ply of absorbent paper web in a decorative pattern with a partial applicator roll that has said decorative pattern defined thereon, said solution being applied in said decorative pattern only to said pixel-like projections, and not to areas on said first ply in between said projections; and means for laminating said first ply to said second ply so that said pixel-like projections of said first ply are glued together with corresponding pixel-like projections of said second ply in said decorative pattern, but not outside of said decorative pattern, whereby the decorative pattern will be defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.

According to a fourth aspect of the invention, a method of making a multi-ply absorbent consumer paper product includes steps of: (a) embossing a first ply of absorbent paper web with a first substantially regular pattern of pixel-like projections; (b) providing a second ply of absorbent paper web; (c) applying a solution that is both a glue and a dye to the first ply of absorbent paper web in a decorative pattern with a partial applicator roll that has the decorative pattern defined thereon, the solution being applied in the decorative pattern only to the pixel-like projections, and not to areas on the first ply in between the projections; and (d) laminating the first ply to the second ply so that the pixel-like projections of the first ply are glued together with the second ply in the decorative pattern, but not outside of the decorative pattern, whereby the decorative pattern will be defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of; the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.

According to a fifth aspect of the invention, a multi-ply absorbent consumer paper product includes a first ply of absorbent paper web having a first substantially regular pattern of pixel-like projections defined thereon; a second ply of absorbent paper web; and a glue/dye material applied between the first and second plies to selected pixel like projections on the first ply, but not elsewhere on the first and second plies, in a predetermined decorative pattern, whereby the decorative pattern is defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compac-

tion of the glued areas, creating a striking visual effect that will be appealing to consumers.

According to a sixth aspect of the invention, a system for making a multi-ply absorbent consumer paper product includes a first embossing system for embossing a first ply of absorbent paper web with a first substantially regular pattern of pixel-like projections; a system for providing a second ply of absorbent paper web with a second substantially regular pattern of pixel-like projections that is substantially identical to the first pattern; a system for applying a solution that is both a glue and a dye to the first ply of absorbent paper web in a decorative pattern with a partial applicator roll that has the decorative pattern defined thereon, the solution being applied in the decorative pattern only to the pixel-like projections, and not to areas on the first ply in between the projections; and a system for laminating the first ply to the second ply so that the pixel-like projections of the first ply are glued to to the second ply in the decorative pattern, but not outside of the decorative pattern, whereby the decorative pattern will be defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.

These and various other advantages and features of novelty which characterize the invention are pointed out with particularity in the claims annexed hereto and forming a part hereof. However, for a better understanding of the invention, its advantages, and the objects obtained by its use, reference should be made to the drawings which form a further part hereof, and to the accompanying descriptive matter, in which there is illustrated and described a preferred embodiment of the invention.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

FIGURE 1 is a diagrammatical depiction of an improved system for making a multi-ply absorbent consumer paper product according to a preferred embodiment of the invention;  
 FIGURE 2 is a diagrammatical cross sectional depiction of a product that is manufactured by the system shown in FIGURE 1;  
 FIGURE 3 is a fragmentary perspective view depiction of one preferred embodiment of a product that can be manufactured with the system shown in FIGURE 1; and  
 FIGURE 4 is a fragmentary perspective view depiction of a second embodiment of a product that can be manufactured by the system shown FIGURE 1.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)**

Referring now to the drawings, wherein like reference numerals designate corresponding structure

throughout the views, and referring in particular to FIGURES 1 and 2, an improved system 10 for making a multi-ply absorbent consumer paper product 12 that is formed from at least a first ply 14 of absorbent paper web material and a second ply 16 of absorbent paper web material includes a first embossing mechanism 18 and a second embossing mechanism 24. As may best be seen in FIGURE 1, first embossing mechanism 18 includes a first embossing roller 20, which is preferably metallic, and an oppositely facing roller 22 that is biased against first embossing roller 20 and is preferably fabricated from an elastomeric material such as rubber. Similarly, second embossing mechanism 24 includes a second embossing roller 26, which is preferably metallic, and an oppositely facing roller 28, which is preferably rubber, biased against second embossing roller 26. Preferably, both first and second embossing rollers 20, 26 have a regular pattern of pin-like knuckles 30 protruding therefrom, in identical patterns, as is diagrammatically represented in FIGURE 1. As may be seen in FIGURE 1, the pin-like knuckles 30 create corresponding projections 32 on the first and second plies 14, 16, respectively, as a result of the embossing that is performed by first and second embossing rollers 20, 26.

Referring again to FIGURE 1, system 10 further includes a glue-dye application mechanism 34 that includes a reservoir 36 that is filled with a glue-dye solution 38, a pick up or fountain roller 40 that is mounted to rotate so as to be partially immersed in the glue-dye solution 38, an intermediate or anilox roller 42 that is in contact with pick up roller 40, and a partial applicator or cliches roller 44 that is in contact with intermediate roller 42, as is shown in FIGURE 1. Partial applicator roller 44 has a number of recesses 46 defined therein in a predetermined pattern that corresponds to the intended print pattern on the final product 12. For example, the pattern of recesses 46 on partial applicator roller 44 will be a series of repeating diamond shaped recesses to form the pattern that is shown in the embodiment of FIGURE 3. To form the pattern shown in the embodiment of FIGURE 4, the recesses 46 will be configured as a series of repeating wave like channels. As may be seen in FIGURE 1, the outer surface of the partial applicator roller 44 is in contact with a surface of the first ply 14 of absorbent paper web that is opposite the surface of web 14 that is in contact with first embossing roller 20. The partial applicator roller 44 contacts only the very end of projections 32 on the first ply 14 of absorbent paper web, and only at areas of the roller 44 that are not provided with a recess 46. Accordingly, glue-dye application mechanism 34 applies the glue-dye mixture to the first ply 14 in the pattern that is dictated by the configuration of the recesses 46 on partial applicator roller 44, and only at the ends of projections 32, resulting in application of the desired pattern to the first ply 14 in a pixel-like pattern of colored dots. According to one important aspect of the invention, the two embossed webs 14, 16 are then laminated to each other in a pin to pin orientation or technology, meaning that there is no nesting

between the two webs 14, 16, and each projection 32 on first ply 14 to which the glue-dye mixture has been applied will be glued to a corresponding projection 32 on the second ply 16. Referring now to FIGURE 2, it will be seen that this creates a product 12 that has a series of compressed areas 50, where the projections 32 are laminated together, separated by a matrix of non compressed area 52. Moreover, laminated areas 54 are defined where the compressed areas 50 are secured together by the glue-dye substance 56. The laminated areas 54 will, as viewed by the consumer, have the desired pattern visible thereon as formed by the pixel-like application of the glue-dye. The adjacent non laminated areas 58 will, in contrast, appear puffier to the eye of a consumer, since they are not glued together in the manner of the laminated areas 54, and will additionally have no coloration visible therein. This registration between the colored areas and the compressed areas creates a striking visual effect that will be appealing to consumers. Moreover, since the desired image is formed in a pixel-like pattern, it will appear neater, and there is little chance of visibly irregular color intensities, line thickness, or borders on the pattern that might cause a customer to conclude rightly or wrongly, that there are quality problems with the product.

It has been found that the visual impact of the inventive product 12 is maximised when adjacent knuckles 30 on the embossing rolls 20, 26, and thus adjacent projections 32 on the webs 14, 16 are spaced apart at a distance that is within the range of substantially 0.7 millimeters to substantially 7 millimeters, with a more preferred range of about 2 millimeters to about 3 millimeters. Preferably, the pin-like knuckles 30 on the embossing rollers 20, 26 are approximately 0.5 to approximately 3.0 millimeters in length, with a more preferred range of 0.9 millimeters to 1 millimeter. The knuckles 30 also are preferably approximately 0.4 millimeters to approximately 1.4 millimeters in width, with a optimum width of approximately 0.9 millimeters. Partial applicator roll 44 is preferably constructed so that the recesses 46 therein have a depth that is approximately 2.0 millimeters to approximately 10.0 millimeters in depth, with a more preferred depth of approximately 3.0 millimeters.

Thus, this invention provides an improved absorbent paper product, an improved processes and system for manufacturing such a product, that provides an improved consumer perception of bulk and product quality in comparison to absorbent paper products heretofore known.

It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size and arrangement of parts within the principles of the invention to the full extent indicated

by the broad general meaning of the terms in which the appended claims are expressed.

### Claims

1. A method of making a multi-ply absorbent consumer paper product, comprising steps of:
  - (a) embossing a first ply of absorbent paper web with a first substantially regular pattern of pixel-like projections;
  - (b) embossing a second ply of absorbent paper web with a second substantially regular pattern of pixel-like projections that is substantially identical to the first pattern;
  - (c) applying a solution that is both a glue and a dye to the first ply of absorbent paper web in a decorative pattern with a partial applicator roll that has the decorative pattern defined thereon, the solution being applied in the decorative pattern only to the pixel-like projections, and not to areas on the first ply in between the projections; and
  - (d) laminating the first ply to the second ply so that the pixel-like projections of the first ply are glued together with corresponding pixel-like projections of the second ply in the decorative pattern, but not outside of the decorative pattern, whereby the decorative pattern will be defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.
2. A method according to claim 1, wherein step (a) is performed by an embossing roll having a substantially regular pattern of pixel-like projections thereon, with adjacent projections on the embossing roll being spaced apart at a distance that is within the range of substantially 0.7 mm to substantially 7 mm.
3. A method according to claim 2, wherein step (a) is further performed by an embossing roll with adjacent projections being spaced apart at a distance that is within the range of substantially 2 mm to substantially 3 mm.
4. A method according to claim 2, wherein step (a) is performed with an embossing roll having projections thereon that are approximately 0.50 mm to 3.0 mm in length.
5. A method according to claim 4, wherein step (a) is performed with an embossing roll having projections thereon that are approximately 0.90 mm to 1.0 mm in length.
6. A method according to claim 2, wherein step (a) is performed with an embossing roll having projections thereon that are approximately 0.4 mm to 1.4 mm in width.
7. A method according to claim 6, wherein step (a) is performed with an embossing roll having projections thereon that are approximately 0.9 mm in width.
8. A method according to claim 1, wherein step (c) is performed with a partial applicator roll that has said decorative pattern defined thereon at a depth that is approximately 2 mm to 10 mm.
9. A method according to claim 8, wherein step (c) is performed with a partial applicator roll that has said decorative pattern defined thereon at a depth that is approximately 3 mm.
10. An absorbent paper product that is made according to the method set forth in claim 1.
11. A multi-ply absorbent consumer paper product, comprising:
 

a first ply of absorbent paper web having a first substantially regular pattern of pixel-like projections defined thereon;

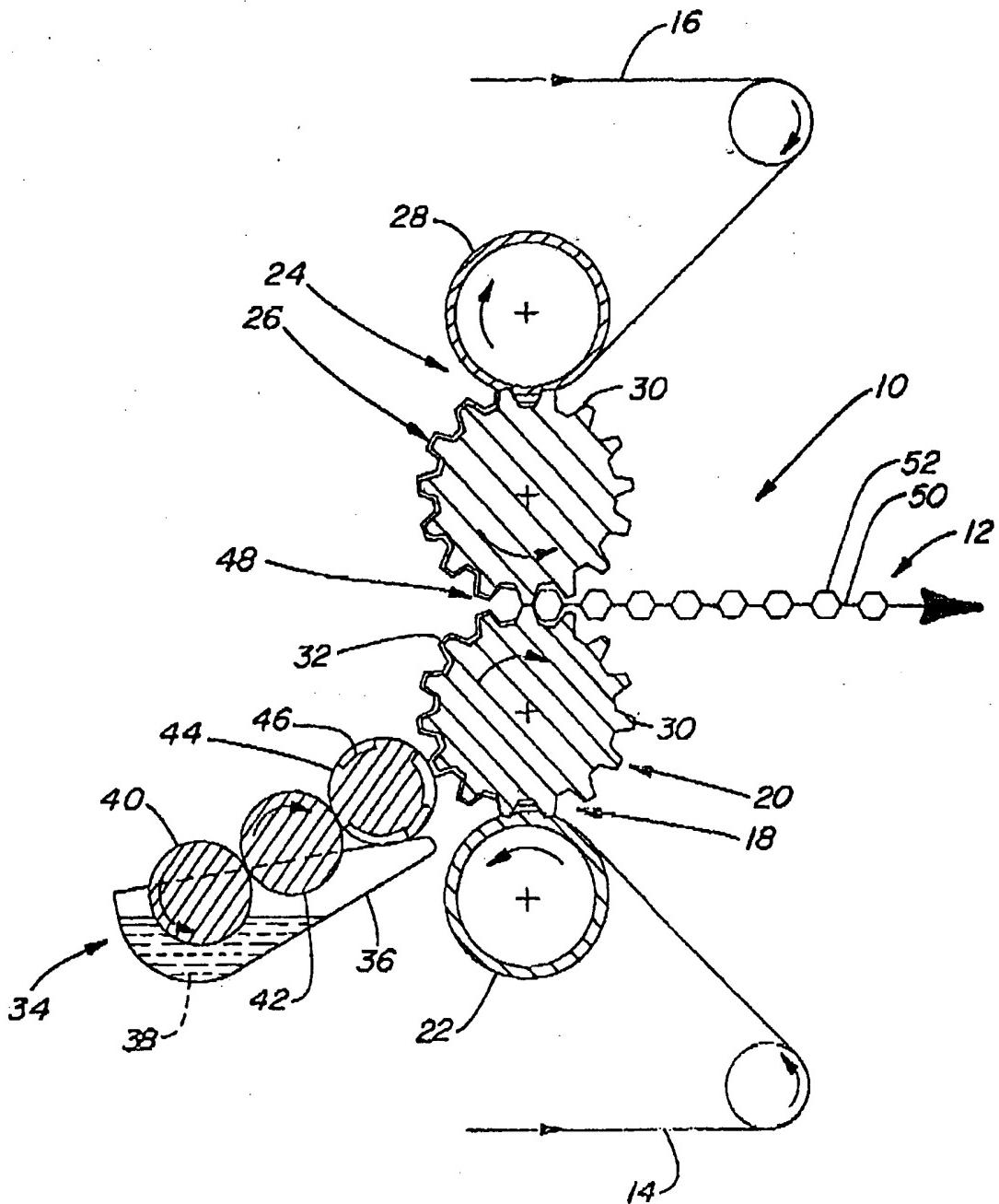
a second ply of absorbent paper web having a second substantially regular pattern of pixel-like projections defined thereon, said second ply being laminated to said first ply so that said pixel-like projections of said first ply are positioned substantially in abutment with corresponding pixel-like projections of said second ply so as to form projection couples; and

a glue/dye material applied between said first and second plies to selected projection couples, but not elsewhere on the first and second plies, in a predetermined decorative pattern, whereby the decorative pattern is defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.
12. A product according to claim 11, wherein adjacent projections on said plies are spaced apart at a distance that is within the range of substantially 0.7 mm to substantially 7 mm.
13. A product according to claim 12, wherein adjacent projections on said plies are spaced apart at a distance that is within the range of substantially 2 mm to substantially 3 mm.

14. A product according to claim 12, wherein said projections are approximately 0.50 mm to 3.0 mm in length.
15. A product according to claim 14, wherein said projections are approximately 0.90 mm to 1.0 mm in length. 5
16. A product according to claim 12, wherein said projections are approximately 0.4 mm to 1.4 mm in width. 10
17. A product according to claim 16, wherein said projections are approximately 0.9 mm in width. 15
18. A product according to claim 11, wherein said glue/dye material comprises a laminating adhesive. 20
19. A product according to claim 18, wherein said glue/dye material further comprises an ink. 25
20. A product according to claim 11, wherein said glue/dye material is applied between said first and second plies to selected projection couples so as to form a wave-like pattern, whereby the wave-like pattern is defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.
21. A product according to claim 11, wherein said glue/dye material is applied between said first and second plies to selected projection couples so as to form a repeating diamond pattern, whereby the repeating diamond pattern is defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers. 30
22. A system for making a multi-ply absorbent consumer paper product, comprising:
- first embossing means for embossing a first ply of absorbent paper web with a first substantially regular pattern of pixel-like projections; second embossing means for embossing a second ply of absorbent paper web with a second substantially regular pattern of pixel-like projections that is substantially identical to said first pattern; means for applying a solution that is both a glue and a dye to said first ply of absorbent paper web in a decorative pattern with a partial applicator roll that has said decorative pattern defined thereon, said solution being applied in said decorative pattern only to said pixel-like, 35
- projections, and not to areas on said first ply in between said projections; and means for laminating said first ply to said second ply so that said pixel-like projections of said first ply are glued together with corresponding pixel-like projections of said second ply in said decorative pattern, but not outside of said decorative pattern, whereby the decorative pattern will be defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers. 40
23. A system according to claim 22, wherein said first embossing means comprises an embossing roll having a substantially regular pattern of pixel-like projections thereon, with adjacent projections on said embossing roll being spaced apart at a distance that is within the range of substantially 0.7 mm to substantially 7 mm. 45
24. A system according to claim 23, wherein said first embossing means further comprises an embossing roll with adjacent projections being spaced apart at a distance that is within the range of substantially 2 mm to substantially 3 mm. 50
25. A system according to claim 22, wherein said first embossing means comprises an embossing roll having projections thereon that are approximately 0.50 mm to 3.0 mm in length. 55
26. A system according to claim 25, wherein said first embossing means comprises an embossing roll having projections thereon that are approximately 0.90 mm to 1.0 mm in length. 60
27. A system according to claim 22, wherein said first embossing means comprises an embossing roll having projections thereon that are approximately 0.4 mm to 1.4 mm in width. 65
28. A system according to claim 27, wherein said first embossing means comprises an embossing roll having projections thereon that are approximately 0.9 mm in width. 70
29. A system according to claim 22, wherein said laminating means comprises a partial applicator roll that has said decorative pattern defined thereon at a depth that is approximately 2 mm to 10 mm. 75
30. A system according to claim 29, wherein said laminating means comprises a partial applicator roll that has said decorative pattern defined thereon at a depth that is approximately 3 mm. 80

31. An absorbent paper product that is made by the system set forth in claim 22.
32. A method of making a multi-ply absorbent consumer paper product, comprising steps of:
- (a) embossing a first ply of absorbent paper web with a first substantially regular pattern of pixel-like projections;
  - (b) providing a second ply of absorbent paper web;
  - (c) applying a solution that is both a glue and a dye to said first ply of absorbent paper web in a decorative pattern with a partial applicator roll that has said decorative pattern defined thereon, said solution being applied in said decorative pattern only to said pixel-like projections, and not to areas on said first ply in between said projections; and
  - (d) laminating said first ply to said second ply so that said pixel-like projections of said first ply are glued together with said second ply in said decorative pattern, but not outside of said decorative pattern, whereby the decorative pattern will be defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.
33. A multi-ply absorbent consumer paper product, comprising:
- a first ply of absorbent paper web having a first substantially regular pattern of pixel-like projections defined thereon;
  - a second ply of absorbent paper web; and
  - a glue/dye material applied between said first and second plies to selected pixel like projections on said first ply, but not elsewhere on the first and second plies, in a predetermined decorative pattern, whereby the decorative pattern is defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.
34. A system for making a multi-ply absorbent consumer paper product, comprising:
- first embossing means for embossing a first ply of absorbent paper web with a first substantially regular pattern of pixel-like projections;
  - means for providing a second ply of absorbent paper web with a second substantially regular
- pattern of pixel-like projections that is substantially identical to said first pattern;
- means for applying a solution that is both a glue and a dye to said first ply of absorbent paper web in a decorative pattern with a partial applicator roll that has said decorative pattern defined thereon, said solution being applied in said decorative pattern only to said pixel-like projections, and not to areas on said first ply in between said projections; and
- means for laminating said first ply to said second ply so that said pixel-like projections of said first ply are glued to to said second ply in said decorative pattern, but not outside of said decorative pattern, whereby the decorative pattern will be defined in pixel-like fashion and will visibly coincide with the interface between the (i) relative puffiness of the unglued areas and the (ii) relative compaction of the glued areas, creating a striking visual effect that will be appealing to consumers.
35. Absorbent paper product comprising at least two plies of absorbent paper webs,
- at least one of said plies having a pattern of pixel-like projections defined thereon, wherein selected projections are provided with a dye and/or a glue material in a predetermined decorative pattern, the pixels provided with a glue connecting the paper web to the surface of an adjoining paper web, whereby the decorative pattern is defined in pixel-like fashion and will be visible/coincide with the interface between (1.) unglued but dyed projections and/or (2.) glued and dyed projections, and/or (3.) unglued and not dyed projections, and/or (4.) glued but not dyed projections.

FIG. 1



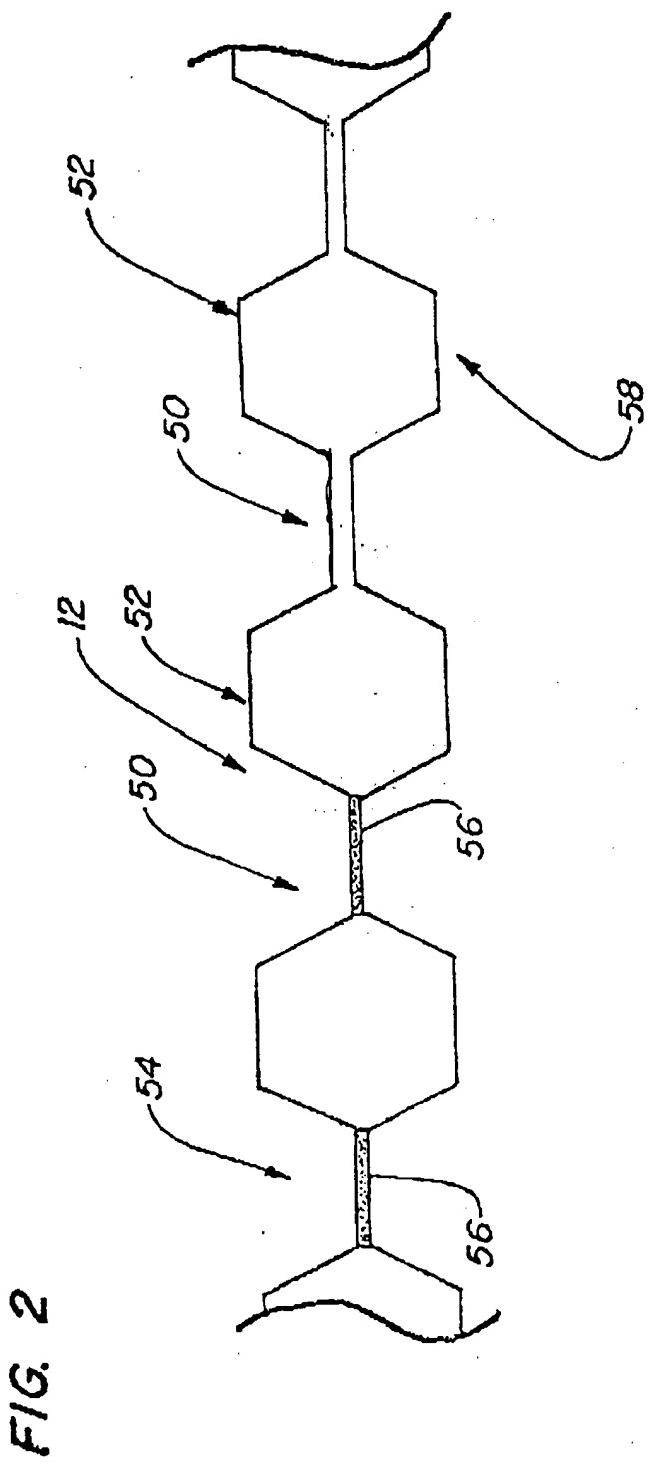


FIG. 2

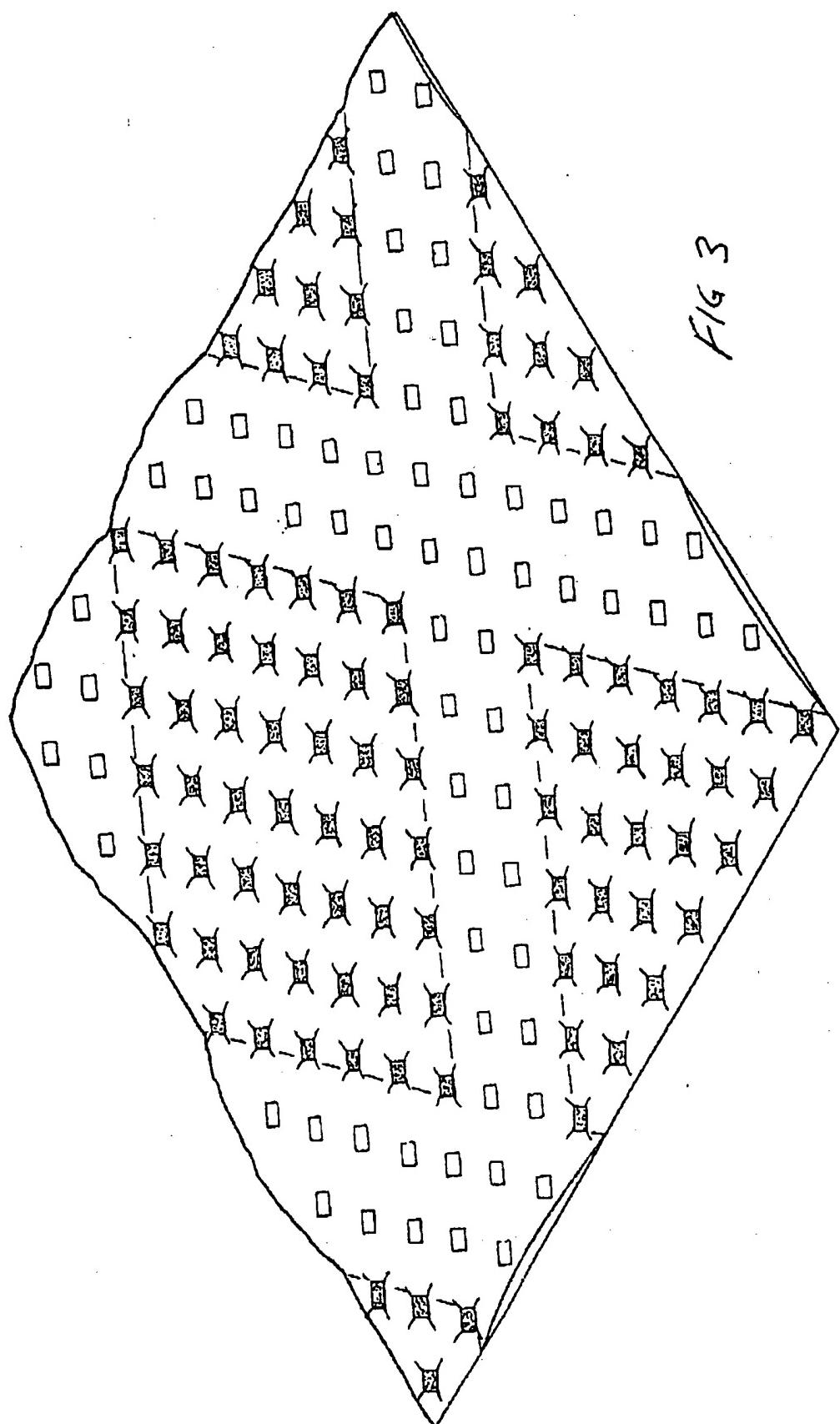
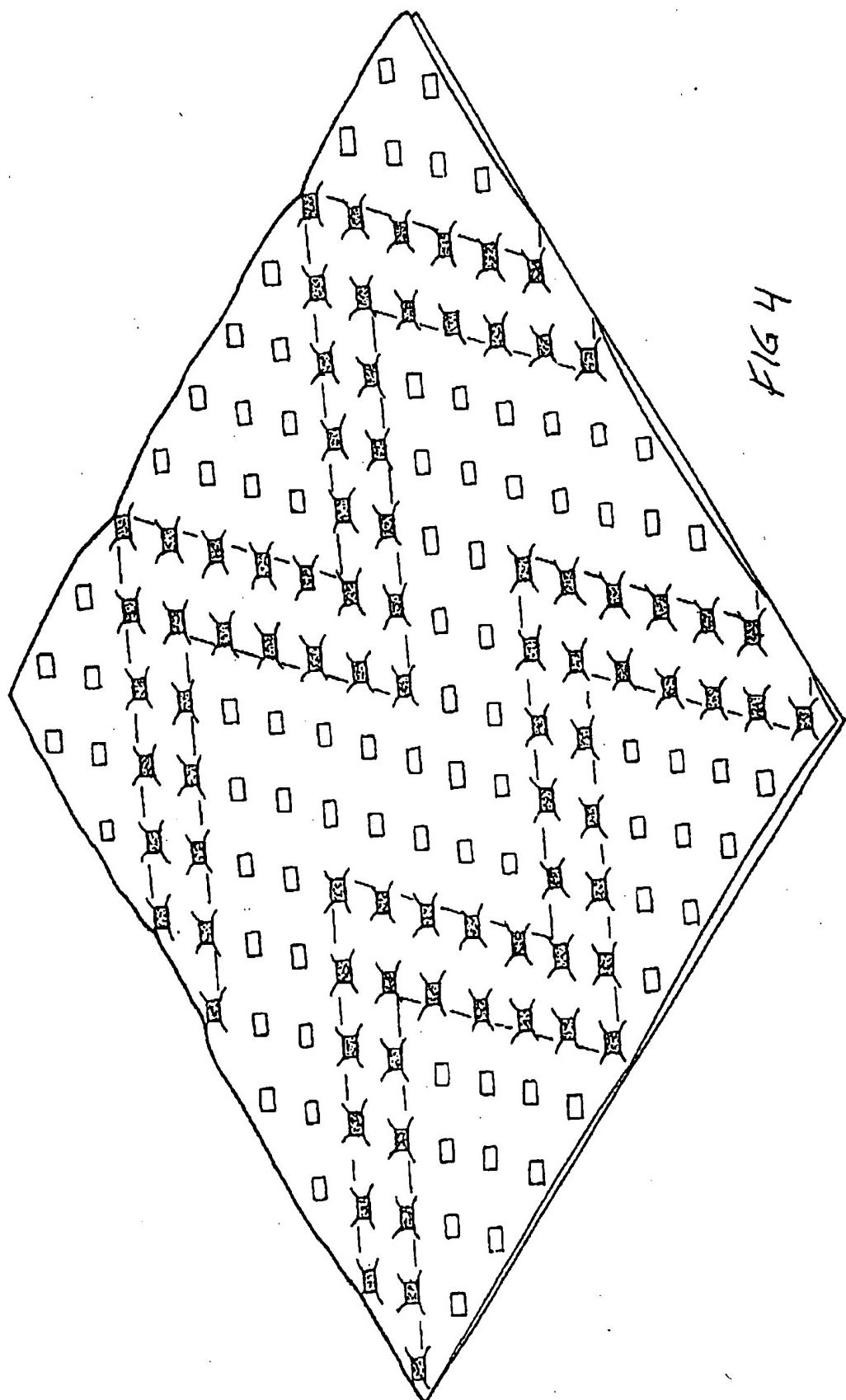


FIG 3





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 95 20 0946

| DOCUMENTS CONSIDERED TO BE RELEVANT  |  |                   | CLASSIFICATION OF THE APPLICATION (Int.Cl.) |  |  |
|--|--|-------------------|---|--|--|
| Category   | Citation of document with indication, where appropriate, of relevant passages                                | Relevant to claim |   |  |  |
| X  | DE 20 31 498 A (PAPER CONVERTING MACHINE COMPANY) 5 January 1972<br>* page 4 - page 5; claims 1-4; figures * | 1-35              | B31F1/07<br>D21H27/40                       |  |  |
| A  | US 3 961 119 A (THOMAS GORDON D) 1 June 1976<br>* figures *  | 1-35              |   |  |  |
| A  | EP 0 265 298 A (BEGHIN SAY SA) 27 April 1988<br>* figures *  | 1-35              |   |  |  |
| A  | US 4 320 162 A (SCHULZ GALYN A) 16 March 1982<br>* figures *   | 1-35              |   |  |  |
| -----  |  |                   | TECHNICAL FIELDS SEARCHED (Int.Cl.)         |  |  |
| -----  |  |                   | B31F<br>D21H                                |  |  |
| The present search report has been drawn up for all claims   |  |                   |   |  |  |
| Place of search  | Date of completion of the search   | Examiner          |   |  |  |
| THE HAGUE  | 29 September 1995  | KOSICKI, T        |   |  |  |
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